

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

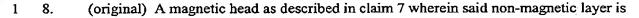
- 1 1. (currently amended) A magnetic head including a read head structure, comprising:
- a free magnetic layer, including a central region and outwardly disposed end regions
- 3 thereof; said free magnetic layer having a planar upper surface thereof that extends across said
- 4 central region and across each of said end regions;
- 5 an anti-parallel coupled magnetic layer structure being disposed directly upon said upper
- 6 surface of said free magnetic layer at said end regions thereof, said anti-parallel coupled
- 7 magnetic layer structure including at least two anti-parallel coupled magnetic layers.



- 2 layer is disposed between said at least two said magnetic layers.
- 1 3. (currently amended) A magnetic head as described in claim 1 wherein said anti-parallel
- 2 coupled magnetic layer structure includes a magnetic seed layer that is disposed directly upon
- 3 said upper surface of said free magnetic layer at said end regions of said free magnetic layer, and
- 4 said a first one of said at least two magnetic layers is disposed directly upon said seed layer.
- 1 4. (original) A magnetic head as described in claim 3 wherein said seed layer is formed
- 2 with a BCC crystal structure.
- 1 5. (original) A magnetic head as described in claim 4, wherein said seed layer is comprised
- of CoFeCr, and has a thickness of from approximately 10 Å to approximately 50 Å.



- 1 6. (original) A magnetic head as described in claim 3 wherein a thin film nonmagnetic
- 2 layer is disposed on top of said first magnetic layer, and a second one of said at least two
- 3 magnetic layers is disposed on top of said nonmagnetic layer.
- 1 7. (original) A magnetic head as described in claim 6 wherein said first and second
- 2 magnetic layers are comprised of CoPtCr, and said first magnetic layer has a thickness that is
- 3 from approximately 20 Å to approximately 30 Å and said second magnetic layer has a thickness
- 4 of from approximately 30 Å to approximately 80 Å.



- 2 comprised of Ru and has a thickness that is approximately 8 Å.
- 1 9. (original) A magnetic head as described in claim 7 wherein said seed layer has a
- 2 thickness, and the total thickness of said seed layer plus said first magnetic layer is greater than
- 3 the thickness of said second magnetic layer.
- 1 10. (original) A magnetic head as described in claim 1, wherein said anti-parallel coupled
- 2 magnetic layers have a net magnetostatic field in the same direction as a magnetic field of said
- 3 free layer.
- 1 11. (currently amended) A magnetic head as described in claim 6, wherein a third thin film
- 2 magnetic layer is disposed between said first magnetic layer and said nonmagnetic layer, and a





- fourth magnetic layer is disposed between said nonmagnetic layer and a said second magnetic 3
- layer. 4
- (original) A magnetic head as described in claim 11, wherein said third magnetic layer 1 12.
- 2 and said fourth magnetic layer are comprised of CoFe.
- 1 13. (currently amended) A magnetic head including a GMR sensor, comprising:
- a plurality of thin film layers forming a GMR sensor, wherein at least one of said layers 2
- is a free magnetic layer, said free magnetic layer including a planar central portion and two 3
- outwardly disposed planar end regions thereof, said planar end regions being coplanar with said 4
- 5 planar central portion of said free magnetic layer;
- 6 a magnetic seed layer being disposed directly upon said planar end regions;
- a first magnetic layer being disposed directly upon said seed layer; 7
- 8. a nonmagnetic layer being disposed upon said first magnetic layer;
- 9 a second magnetic layer being disposed upon said nonmagnetic layer;
- wherein said first magnetic layer is formed with a magnetic field and said second 10
- magnetic layer is formed with a magnetic field, and wherein the magnetic fields of said first 11
- 12 magnetic layer and said magnetic layer are anti-parallel coupled.
- 1 14. (original) A magnetic head as described in claim 13, wherein said free magnetic layer is
- formed with a magnetic field in a first direction and said anti-parallel coupled magnetic field of 2
- said first magnetic layer and said second magnetic layer is formed with a magnetostatic bias in 3
- the same direction as the magnetic field of said free magnetic layer.





- 1 15. (original) A magnetic head as described in claim 13 wherein said seed layer is formed
- 2 with a BCC crystal structure.
- 1 16. (original) A magnetic head as described in claim 15 wherein said seed layer is comprised
- 2 of CoFeCr, and said first magnetic layer is comprised of CoPtCr, and said nonmagnetic layer is
- 3 comprised of Ru, and said second magnetic layer is comprised of CoPtCr.
- 1 17. (original) A magnetic head as described in claim 16 wherein a layer being comprised of
- 2 CoFe is disposed between said first magnetic layer and said nonmagnetic layer, and a second
- 3 layer comprised of CoFe is disposed between said nonmagnetic layer and said second magnetic
- 4 layer.
- 1 18. (currently amended) A hard disk drive including a magnetic head having a read head
- 2 structure, comprising:
- a free magnetic layer, including a central region and outwardly disposed end regions
- 4 thereof; said free magnetic layer having a planar upper surface thereof that extends across said
- 5 central region and across each of said end regions;
- 6 an anti-parallel coupled magnetic layer structure being disposed directly upon said upper
- 7 surface of said free magnetic layer at said end regions thereof, said anti-parallel coupled
- 8 magnetic layer structure including at least two anti-parallel coupled magnetic layers.
- 1 19. (original) A hard disk drive as described in claim 18 wherein a thin film nonmagnetic
- 2 layer is disposed between said at least two magnetic layers.



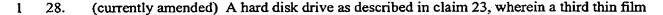
- 1 20. (currently amended) A hard disk drive as described in claim 18 wherein said antiparallel
- 2 coupled magnetic layer structure includes a magnetic seed layer that is disposed directly upon
- 3 said upper surface of said free magnetic layer at said end regions of said free magnetic layer, and
- 4 said first one of said at least two magnetic layers is disposed directly upon said seed layer.
- 1 21. (original) A hard disk drive as described in claim 20 wherein said seed layer is formed.
- 2 with a BCC crystal structure.



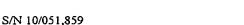
- 2 comprised of CoFeCr, and has a thickness of from approximately 10 Å to approximately 50 Å.
- 1 23. (original) A hard disk drive as described in claim 20 wherein a thin film non-magnetic
- 2 layer is disposed on top of said first magnetic layer, and a second one of said at least two
- 3 magnetic layers is disposed on top of said non-magnetic layer.
- 1 24. (original) A hard disk drive as described in claim 23 wherein said first and second
- 2 magnetic layers are comprised of CoPtCr, and wherein said first magnetic layer has a thickness
- 3 that is from approximately 20 Å to approximately 30 Å and said second magnetic layer has a
- 4 thickness that is from approximately 30 Å to approximately 80 Å.
- 1 25. (original) A hard disk drive as described in claim 24 wherein said non-magnetic layer is
- 2 comprised of Ru and has a thickness that is approximately 8 Å.



- 1 26. (original) A hard disk drive as described in claim 24 wherein said seed layer has a
- 2 thickness, and the total thickness of said seed layer plus said first magnetic layer is greater than
- 3 the thickness of said second magnetic layer.
- 1 27. (original) A hard disk drive as described in claim 18, wherein said anti-parallel coupled
- 2 magnetic layers have a net magnetostatic field in the same direction as a magnetic field of said
- 3 free layer.



- 2 magnetic layer is disposed between said first magnetic layer and said non-magnetic layer, and a
- 3 fourth magnetic layer is disposed between said non-magnetic layer and a second magnetic layer.
- 1 29. (original) A hard disk drive as described in claim 28, wherein said third magnetic layer
- 2 and said fourth magnetic layer are comprised of CoFe.
- 1 30. (currently amended) A method for fabricating a read head structure of a magnetic head,
- 2 comprising the steps of:
- 3 fabricating a plurality of thin film layers to create a GMR sensor, said layers including a
- 4 free magnetic layer having a central region and outwardly disposed end regions; said free
- 5 magnetic layer having a planar upper surface thereof that extends across said central region and
- 6 across each of said end regions;

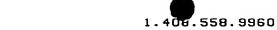




- 7 fabricating an anti-parallel coupled magnetic layer structure directly upon said upper
- 8 surface of said free magnetic layer at said end regions thereof, said anti-parallel coupled
- 9 magnetic layer structure including at least two magnetic layers that are anti-parallel coupled.
- 1 31. (currently amended) A method for fabricating a read head structure as described in claim
- 2 30, including the steps of:
- fabricating a seed layer on top of <u>directly upon</u> said end portions of said free magnetic
- 4 layer;
- fabricating a first said magnetic layer on top of directly upon said seed layer;
- 6 fabricating a nonmagnetic layer above said first magnetic layer; and
- 7 fabricating a second said magnetic layer above said nonmagnetic layer.
- 1 32. (original) A method for fabricating a read head structure as described in claim 31,
- 2 wherein a net magnetostatic field is produced by said anti-parallel coupled magnetic layers, said
- 3 net magnetostatic field being formed in the same direction as a magnetic field of said free
- 4 magnetic layer.
- 1 33. (original) A method for fabricating a read head structure as described in claim 31
- 2 wherein said seed layer is comprised of CoFeCr, said first magnetic layer is comprised of
- 3 CoPtCr, said nonmagnetic layer is comprised of Ru and said second magnetic layer is comprised
- 4 of CoPtCr.







- (original) A method for fabricating a read head structure as described in claim 33 1 34.
- 2 wherein said seed layer is fabricated with a BCC crystal structure.



- 35. (original) A method for fabricating a read head structure as described in claim 34
- including the further steps of fabricating a layer comprised of CoFe between said first magnetic 2
- 3 layer and said nonmagnetic layer, and fabricating a second layer comprised of CoFe between
- said nonmagnetic layer and said second magnetic layer.